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Inflating the Beast: Political Incentives under Uncertainty

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Inflating the Beast: Political Incentives under Uncertainty

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Abstract

High commodity prices and a sustained global expansion have brought about a new policy dilemma for many economies: Why are governments accumulating so much wealth and what should be the fiscal response to this abundance? In this paper we characterize how politicians' rent-seeking incentives and their interaction with political *and* economic uncertainty affect the management of abundance. In the standard political economy model of debt, the presence of political risk leads current governments to over-borrow in order to *starve the beast.* However, when economic risk is significant, we show that the presence of rent-seeking politicians gives rise to an *option value of rent-seeking.* In this case, if economic risk is large relative to political risk, the standard result is overturned and politicians have an incentive to over-save or *inflate the beast.* In the latter scenario, the government also hedges less than is socially optimal. Finally, we show that incentive compatible rules that weaken political risk and the option value of rent-seeking can improve social welfare. One implementation of such rules takes the form of contingent tax caps (lower during booms). In contrast, standard fiscal rules are suboptimal since they do not address the central problem of high taxes.

JEL Codes: E6, H2, H6

Keywords: Public funds, politicians, retained rents, starve the beast, inflate the beast, option value of rent-seeking, commitment, hedging, fiscal rules, tax-caps

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1 Introduction

Not long ago, over-borrowing was the typical financial concern for sovereigns. Today, with the prolonged expansion of the world economy and sustained rise in commodity prices, the concern in many instances is on the other side of the spectrum. All around the world, governments are creating "wealth funds," which, combined with central banks' reserves, add to around 8 trillion dollars today and could easily double this amount by the beginning of the next decade (see, e.g., Johnson 2007). Why are governments creating these large funds? What is the optimal fiscal response to this period of abundance?

In this paper we focus on a particular dimension of the answers to these questions: We characterize how politicians' rent-seeking incentives and their interaction with political *and* economic uncertainty affect the management of abundance.

In the standard political economy model of debt, the presence of political risk leads a rent-seeking government to save less than a benevolent government in order to *starve the beast.*[1] However, this analysis is inconsistent with the fact that some of the biggest savers in the world economy can be categorized as rent-seeking governments. This pattern extends beyond a few special cases. For example, the first column of Table 1 categorizes governments as high versus low rent-seeking based on three standard indicators of institutional quality.[2] It shows that in 2006, high rent-seeking governments on average saved almost 2% more of their GDP than low rent-seeking governments.

Table 1: Average Surplus-GDP Ratio (2006)

	Average	High Fiscal Uncertainty	Low Fiscal Uncertainty
Low Rent-Seeking	$-.011$ ($N = 89$)	$.019$ ($N = 25$)	$-.023$ ($N = 64$)
High Rent-Seeking	$.007$ ($N = 84$)	$.053$ ($N = 45$)	$-.046$ ($N = 39$)

Our model addresses this inconsistency by showing that if economic risk is large relative to political risk, the standard result is overturned and rent-seeking politicians have an incentive to over-save or *inflate the beast* relative to a benevolent government. In our framework, these excessive savings do not result from a standard precautionary motive and are instead the result of an *option value of rent-seeking,* whereby politicians have an increased incentive to postpone rent-extraction as economic volatility increases. This theoretical result is in line with the observation that high rent-seeking governments facing high levels of fiscal uncertainty save the most. As an illustration, Table 1 categorizes

[1] See Alesina and Perotti (1994) for a survey of the literature on the political economy of debt.
[2] See Appendix for details on data construction.

countries as having high fiscal uncertainty if they are significant exporters of oil or ore, since governments often own these resources and are exposed to their price volatility. The table shows that in the subset of countries facing low uncertainty, high rent-seeking governments save *less* than low rent-seeking governments, which is in line with the conventional understanding of the political economy of debt. However, in the subset of countries experiencing high fiscal uncertainty, high rent-seeking governments save *more* than low rent-seeking governments.[3]

Our main results are driven by two forces: the current abundance of fiscal resources and the intertemporal reallocation of rent-seeking. In our model, rent-seeking politicians are partially benevolent since they are not only concerned about deadweight losses from taxation, but they also value rent-extraction. If fiscal resources are very scarce, the benevolent component prevails, and there is no concern with rent-seeking activities. In contrast, if fiscal resources are abundant, the questions of how much and, most importantly, when to extract rents become central.

With regards to the timing of rents, the calculations of the current government considers the actions of the future government. Since rent-extraction can induce a deadweight loss from taxation, the future government has a higher incentive to extract rents during booms than during recessions. In fact, if the future government is given the chance to extract rents at all (i.e., is left with enough resources for it), it would only do so during booms, since otherwise rents could have been extracted earlier in time, which the current government always prefers. This asymmetry introduces a call option-like element in the payoff of the future government, which increases in value with an increase in aggregate uncertainty. By postponing rent extraction and increasing public savings, the current government "purchases" more options and hence raises expected rent-extraction. However, if political risk is high, then the option value does not benefit the current government which is likely to be replaced. Thus, whether economic uncertainty leads to under- or over-saving depends on the relative importance of political versus economic risk.

Given the importance of low political risk and high economic risk in generating an inflate the beast scenario, it follows that our result depends on financial markets being sufficiently incomplete, since otherwise, effective economic uncertainty remains low relative to political risk. In the cases in which the inflate the beast scenario prevails, we

[3] Our characterizations in Table 1 are not sensitive to our discontinuous definition of volatility. For example, in a regression of surplus to GDP ratio on (i) the high rent-seeking dummy, (ii) fuel exports to GDP ratio, and (iii) an interaction term of the latter two variables, the coefficients are -.027, .006, and .308, respectively, with the first and last terms significant at the 5% level. Our characterizations of Table 1 survive conditioning on terms of trade growth. It also survives defining institutional quality using only constraint on the executive (see Appendix).

show that if hedging markets exist but are expensive to use, then the government not only has an incentive to over-save but also one to under-hedge. By hedging, the government reduces the effective aggregate uncertainty faced by taxpayers (which is beneficial), yet it also reduces the option value of rent-seeking (which is costly). If the government faces little political risk, then the latter effect is strong and the government opts for self-insurance which both protects taxpayers from volatility *and* raises the option value of rent-seeking.[4]

In summary, faced with sufficient economic risk, partially benevolent governments have an incentive to over-save and under-hedge. In this context the question arises of whether it is possible to design a set of policy rules that shift the politicians' fiscal and portfolio decisions toward those of a benevolent government. We start from the premise that since these rules are proposed and approved by politicians, they must be incentive compatible to the government in power. We show that a rule that caps taxes in a state contingent fashion is welfare improving as long as both political and economic uncertainty are non-negligible. Politicians are willing to cut rent-extraction and taxes today, if in exchange they get a commitment for similar constraints on future politicians, in particular in the form of a commitment to cut taxes during booms. If the rent-seeking government over-saves in the absence of rules, the presence of rules can induce lower public savings and increased hedging. We also show that the typically used rule of capping public deficits but not taxes is suboptimal since politicians have an incentive to keep taxes too high.

This paper is related to the literature on optimal fiscal policy and debt management dating back to the classical work of Barro (1979) and Lucas and Stokey (1983).[5] We depart from this work by relaxing the assumption of a benevolent government and by assuming that the economy is managed by politicians who derive partial utility from rents and who face potential replacement. In this regard, our paper is related to the vast literature on the political economy of debt, and as in this work, we highlight how potential replacement can lead current governments to starve the beast.[6] We depart from this work in two important respects. First, we allow for economic uncertainty which gives rise to the option value of rent-seeking, leading the current government to potentially inflate the beast. Second, we allow the government to hedge this uncertainty at a premium in order to determine the effect of political economy on the government's portfolio allocation de-

[4]See, e.g. Caballero and Panageas (2007) and Borenzstein and Mauro (2004) for articles advocating an increase in hedging by governments. From this perspective, our paper can be seen as a political economy argument for why governments refuse to adopt modern risk management practices despite the large economic advantages of doing so.

[5]See also Aiyagari, and Marcet, Sargent, and Seppala (2002), Bohn (1990), and Chari and Kehoe (1993a,1993b).

[6]See for example Aghion and Bolton (1990), Alesina and Perotti (1994), Alesina and Tabellini (1990), Battaglini and Coate (2007), Lizzeri (1999), and Persson and Svensson (1989).

cision. This costly hedging scenario also allows us to highlight the importance of market incompleteness for the option value of rent-seeking mechanism.[7] Finally, our paper is related to the literature in public finance which considers policy prescriptions that take into account the potential non-benevolence of policy-makers. Specifically, it builds on the work of Yared (2007) who introduces non-benevolent politicians to the complete market economy of Lucas and Stokey (1983) and who evaluates policy prescriptions.[8] The current paper is different from this work in three important respects. First, in our model, politicians are replaced in equilibrium, and this allows us to examine the interaction between political and economic uncertainty.[9] Second, we focus on the portfolio allocation decision of governments in partially incomplete markets as opposed to complete markets. Third, we provide a procedure for the evaluation of politically sustainable fiscal rules.[10]

This introduction is followed by five sections and an appendix. Section 2 describes the environment and a benchmark in which fiscal policy is implemented by a benevolent government. Section 3 introduces politicians and describes the main mechanisms. Section 4 introduces (costly) hedging instruments and studies the government's portfolio decision and its interaction with the key mechanisms in the model. Section 5 discusses optimal and sub-optimal (but used in practice) fiscal rules, and Section 6 concludes. The Appendix describes the data in Table 1 and includes all of the proofs.

2 Benchmark Model: Benevolent Government

2.1 Economic Environment

We consider a two-period version of the incomplete market economy originally studied by Barro (1979). In Section 4 we examine the effect of allowing for the partial completeness of our economy. In period 0, the government raises tax revenue $\tau_0 \geq 0$ and uses its current exogenous level of assets $A_0 \gtreqless 0$ to purchase assets $A_1 \gtreqless 0$ at a price normalized to 1. In period 1, the government experiences an endowment shock $y = \{-\sigma, \sigma\}$ for which $\Pr\{y = \sigma\} = \Pr\{y = -\sigma\} = 1/2$. The government must finance public spending $\overline{g} > 0$

[7] Battaglini and Coate (2007) allow for (unhedged) economic uncertainty though they do not describe the option value of rent-seeking. They focus on the long run equilibrium with permanent uncertainty in which the benevolent government reaches the natural savings limit.

[8] See Acemoglu, Golosov, and Tsyvinski (2007) for a similar application to a Mirleessian economy without government debt or aggregate shocks.

[9] A subtle difference which allows for this interaction is the partial benevolence of politicians in our framework which directly exposes politicians to economic risk.

[10] In this regard, our paper is related to the work of Kydland and Prescott (1977) which considers the role of limited commitment and policy rules but that maintains the assumption of a benevolent government which we relax.

which represents an increase in liabilities due to factors such as an aging population or decline in commodity-reserves. The government accommodates the endowment shock and the increase in liabilities by raising taxes $\tau_1 \geq 0$ and by using accumulated assets A_1.[11] The government's period 0 budget constraint is

$$\tau_0 = A_1 - A_0, \tag{1}$$

and its period 1 budget constraints under the high and low shock, respectively, are:

$$\tau_1^H = \overline{g} - A_1 - \sigma, \text{ and} \tag{2}$$
$$\tau_1^L = \overline{g} - A_1 + \sigma. \tag{3}$$

Raising revenue creates a deadweight loss. For simplicity, this deadweight loss is quadratic, so that social welfare is equal to:[12]

$$\mathbf{E}_0 \left(-\frac{\tau_0^2}{2} - \frac{\tau_1^2}{2} \right). \tag{4}$$

2.2 Optimal Policy

To fix ideas, we describe the *benevolent* government's policy which maximizes household welfare (4) subject to (1), (2) , (3), and $\tau_0, \tau_1^H, \tau_1^L \geq 0$. Specifically, it entails the government using assets to smooth the deadweight loss of taxation, and since the marginal deadweight loss is equal to the tax itself, the optimal interior solution admits a tax which follows a random walk:

$$\tau_0 = \frac{1}{2}\tau_1^H + \frac{1}{2}\tau_1^L, \tag{5}$$

with a volatility which is increasing in the volatility of the endowment σ. If $\sigma = 0$, for instance, taxes would be perfectly smooth with $\tau_0 = \tau_1^H = \tau_1^L$.

In order to focus on interior solutions for taxes, we assume:

Assumption 1 (Positive Taxes) $\frac{\overline{g} - A_0}{2} > \sigma$.

The following proposition characterizes the solution to the benevolent government's

[11] All of our results can be extended to an infinite horizon economy experiencing a temporary endowment shock. Details available upon request.

[12] As is standard, an open or closed economy in which households possess quasi-linear preferences and in which the government is constrained to linear taxes is associated with a convex deadweight loss function of revenue generation. For expositional simplicity, we assume such a function to be quadratic.

problem. All proofs are in the Appendix. We denote the policies of a benevolent government with superscript b.

Proposition 1 *The benevolent government chooses policies which satisfy:*

$$\begin{aligned}\tau_0^b &= \tau_1^{H,b} + \sigma = \tau_1^{L,b} - \sigma = \frac{\overline{g} - A_0}{2} \text{ and} \\ A_1^b &= \frac{\overline{g} + A_0}{2}.\end{aligned}$$

Note that the level of savings A_1^b is *independent* of σ. This absence of precautionary savings is a result of our assumption of a quadratic cost of taxation (certainty equivalence). It provides a useful benchmark for understanding how the incentives of rent-seeking politicians can alter the way in which the savings decisions of governments respond to changes in economic risk in a manner which is independent of a precautionary motive.

3 Economy with Rent-Seeking Politicians

In the standard political economy model of debt, the presence of political risk leads current governments to over-borrow in order to *starve the beast.* However, when economic risk is significant, we show that the presence of rent-seeking politicians gives rise to an *option value of rent-seeking*. In this case, when economic risk is large relative to political risk, the standard result is overturned and politicians have an incentive to over-save or *inflate the beast.*

3.1 Economic and Political Environment

In order to consider the impact of rent-seeking politicians, we must first modify our benchmark economy to allow for rent-seeking. In particular, imagine if, instead of a benevolent government, the economy is managed by a partially benevolent politician who values social welfare, but who also values rents $x_0 \geq 0$ and $x_1^j \geq 0$ for $j = H, L$ which are extracted in period 0 and 1, respectively. These rents are financed in the same fashion as public spending, so that (1), (2), and (3) in the modified economy become, respectively:

$$\begin{aligned}\tau_0 &= A_1 - A_0 + x_0, &(6)\\ \tau_1^H &= \overline{g} - A_1 - \sigma + x_1^H, \text{ and} &(7)\\ \tau_1^L &= \overline{g} - A_1 + \sigma + x_1^L. &(8)\end{aligned}$$

Like households, politicians value social welfare (4). However, they also value rents conditional on being in power. The politician in period 0 values rents x_0. With probability $q \in (0,1)$ he remains in power in period 1 and consumes rents x_1^j for $j = H, L$, and with probability $1 - q$ he is replaced with an identical politician in period 1 who instead consumes the rents x_1^j. Replacement is independent of and occurs together with the realization of the shock to y. Regime changes are not insurable. The period 1 politician chooses τ_1^j and x_1^j for $j = H, L$ which maximize his welfare

$$-\frac{\left(\tau_1^j\right)^2}{2} + \theta x_1^j, \tag{9}$$

subject to (7) and (8) for $\theta > 0$ which parameterizes the politician's desire for rents. In light of our introduction and Table 1, one can think of $\theta = 0$ as representing a benevolent, low rent-seeking government and a government with $\theta > 0$ as a high rent-seeking government.

Given the behavior of the period 1 politician, the period 0 politician chooses τ_0, x_0, and A_1 which maximize his welfare

$$\mathbf{E}\left(-\frac{\tau_0^2}{2} - \frac{\tau_1^2}{2} + \theta x_0 + q\theta x_1\right) \tag{10}$$

subject to (6), where we have taken into account that the period 0 politician receives period 1 rents (i.e., becomes the period 1 politician) with probability q.

The utility from rents captures the politician's bias toward public spending relative to consumers' preferences. Its linearity is natural in distortionary taxation settings (see, e.g., Battaglini and Coate, 2007) since it amounts to a transfer with no distortionary consequences for given taxes. This is an important assumption in our setting since it implies that politicians are more flexible on the intertemporal reallocation of rents relative to the intertemporal reallocation of tax burdens.[13]

Another feature of this environment is limited commitment. Whoever acquires power in period 1 cannot commit to particular policies in period 0. Consequently, the period 0 politician must take into consideration how his choice of A_1 affects the incentives of the period 1 politician. Note that the presence of limited commitment is only relevant when combined with the incentive for rent-seeking, since the benchmark economy of Section

[13] Under more general utility functions, our results will hold if the curvature in the function associated with the deadweight loss from taxes exceeds the curvature associated with rents. Details available upon request.

2 under a benevolent government is unchanged in the absence of commitment.[14] More specifically, the order of events is as follows:

1. The period 0 politician chooses τ_0, x_0, and A_1.
2. Period 1 shocks are realized:
   (a) Economic shock: $y = \{-\sigma, \sigma\}$.
   (b) Period 0 politician replaced with probability $1 - q$.
3. The period 1 politician chooses τ_1 and x_1.

We denote the policies of politicians with a superscript p. Let us characterize the policies chosen by the period 1 politician.

Lemma 1 *Conditional on A_1, the period 1 politician's strategy is*

$$\begin{aligned} \tau_1^{j,p} &= \max\{\overline{g} - y - A_1, \theta\}, \text{ and} && (11) \\ x_1^{j,p} &= \max\{0, \theta - \overline{g} + y + A_1\} && (12) \end{aligned}$$

for $j = H, L$.

The marginal benefit of rents is θ. Therefore, if rents are positive, the marginal deadweight loss of taxes must also be θ. Alternatively, if taxes exceed θ, then rents are 0.

Remark 1 *$\tau_1^{L,p} \geq \tau_1^{H,p}$ by (11) and $x_1^{H,p} \geq x_1^{L,p}$ by (12).*

The period 1 politician always consumes weakly more rents when the economy is experiencing a boom. This is because the government's budget constraint is looser, and rent-seeking is easier to achieve without additional increases in taxes. In principle, there are three regions to consider:

$$\begin{array}{ll} \text{Region I:} & A_1 < \overline{g} - \sigma - \theta \\ \text{Region II:} & A_1 \in [\overline{g} - \sigma - \theta, \overline{g} + \sigma - \theta] \\ \text{Region III:} & A_1 > \overline{g} + \sigma - \theta \end{array}.$$

Given the anticipated behavior of the period 1 government, if the period 0 politician remains in power in period 1, his continuation welfare is

[14] In Section 5, we consider how much rents politicians are willing to sacrifice in exchange for commitment.

$$V^P(A_1)=\begin{cases} -\frac{(\overline{g}-A_1)^2+\sigma^2}{2} & \text{Region I} \\ -\frac{1}{2}\frac{\theta^2}{2}-\frac{1}{2}\frac{(\overline{g}+\sigma-A_1)^2}{2}+\frac{1}{2}\theta\left(\theta+\sigma-\overline{g}+A_1\right) & \text{Region II} \\ -\frac{\theta^2}{2}+\theta\left(\theta-\overline{g}+A_1\right) & \text{Region III} \end{cases}.$$

If $A_1<\overline{g}-\sigma-\theta$, the government in period 1 is relatively poor, so that it is inefficient to use government resources for rents in period 1. For intermediate values of A_1 in the range $[\overline{g}-\sigma-\theta,\overline{g}+\sigma-\theta]$, rents are appropriated only under a favorable y shock in period 1. If $A_1>\overline{g}+\sigma-\theta$ rents are appropriated under both shocks in period 1.

If the period 0 politician is thrown out of power in period 1, his continuation welfare is

$$V^N(A_1)=\begin{cases} -\frac{(\overline{g}-A_1)^2+\sigma^2}{2} & \text{Region I} \\ -\frac{1}{2}\frac{\theta^2}{2}-\frac{1}{2}\frac{(\overline{g}+\sigma-A_1)^2}{2} & \text{Region II} \\ -\frac{\theta^2}{2} & \text{Region III} \end{cases},$$

where we take into account that he receives no benefit from the rents appropriated by the period 1 politician.

Collecting terms, we have that the period 0 politician's problem can be written as:

$$\max_{\tau_0,x_0,A_1}\ -\frac{\tau_0^2}{2}+\theta x_0+qV^P(A_1)+(1-q)\,V^N(A_1)$$
$$\text{s.t. } (6)\text{, and } \tau_0,x_0\geq 0.$$

It is apparent from the objective that as long as $q<1$, which we assume throughout, we can disregard region III. The date 0 politician will never leave enough resources for the date 1 politician to consume rents in both states of the world, for in such case it is strictly better for the current politician to consume with certainty a bit more rents at date 0. In the next sections we characterize the solution to this problem in the remaining regions.

3.2 Starve or Inflate the Beast?

Figure 1: Savings by Government Type

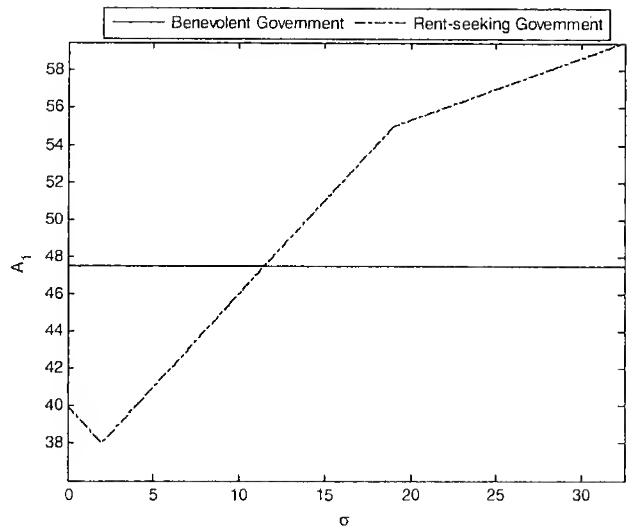


Figure 1 illustrates the choice of A_1 as a function of economic uncertainty for a given level of political risk.[15] There are two sets of important results in this figure: The first one refers to the slope of politician's saving function with respect to economic uncertainty. The second refers to the level of savings for different values of economic uncertainty. We discuss the first set of results in the next section, when explaining the option value of rent-seeking, while here we focus on the level results.

The figure shows that whether politicians save less or more than a benevolent government depends on the relative importance of economic and political uncertainty. The standard political economy model focuses on cases of low economic and high political uncertainty (low σ and low q), which leads to the classic "starve the beast" result of depressed savings (or higher debt) under politicians relative to a benevolent government. However, it is clear from the figure that when the opposite configuration of uncertainty takes place, the result is rather one of "inflate the beast", or higher savings relative to a benevolent government. The following proposition summarizes this discussion. The assumption preceding it ensures that the economy is in a situation of relative *abundance,* in the sense that the period 0 politician chooses positive rents at some date.

Assumption 2 (Abundance) $A_0 > \overline{g} - 2\theta$.

[15]The parameters chosen in the figures are $(A_0, \overline{g}, \theta, q) = (15, 80, 40, .9)$.

Proposition 2 $A_1^p > (<) A_1^b$ *if* $\sigma > (<) \theta (2-q) - \frac{\bar{g}-A_0}{2}$.

Importantly, the high savings in the politicians' equilibrium needs not represent good news for society, as these savings are not so much driven by tax-stabilization as they are by future rent extraction. Figure 2 illustrates rents at date 0 and during the high state at date 1.[16] For low levels of economic uncertainty, the economy is in region I (no rents at date 1) and an increase in uncertainty lowers savings and increases early rent extraction (to be explained in the next section). At higher levels of economic uncertainty the economy enters region II (positive rents at date 1 in the high state) and an increase in this uncertainty leads to an intertemporal reallocation of rent extraction from date 0 to the boom state in date 1.

Figure 2: Rents by Government Type

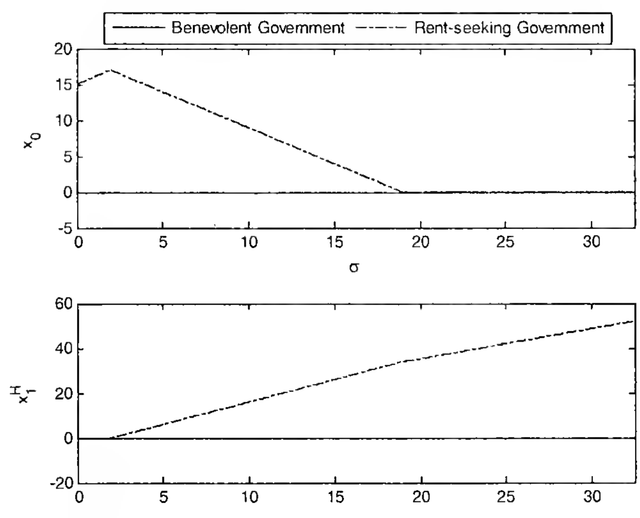
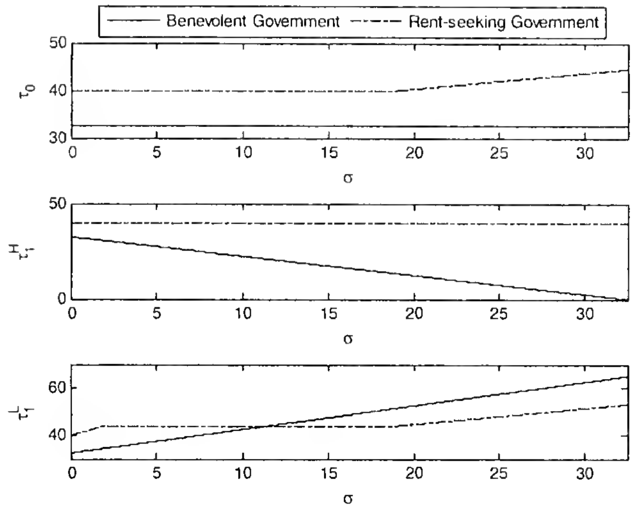


Figure 3 illustrates the path of taxes behind these rents and savings. There are three results that stand out: First, on average, taxes are higher in the presence of politicians. Second (bottom panel), as economic uncertainty rises, high public savings by politicians do protect taxpayers during recessions since, unlike the case for the benevolent government, taxes increase less than one for one with uncertainty. Third, and most importantly (middle panel), politicians fail to cut taxes during booms. Thus, for high economic uncertainty, politicians extract a large amount of rents during booms (second panel of Figure 2), as

[16] Recall that rents in the low state at date 1 are always zero since $q < 1$.

they arrive to that state with high savings and unwilling to cut taxes.

Figure 3: Taxes by Government Type



3.3 Option Value of Rent-seeking and Political Risk

Let us now return to the slope of the response of savings to changes in economic uncertainty, which we describe in the following corollary to Proposition 2:

Corollary 1 *A_1^p is increasing (decreasing) in σ for $\sigma > (<) \theta(1-q)/2$.*

Why are public savings affected by economic uncertainty in the political equilibrium? Or, what breaks the certainty equivalence result of the benevolent government? In a nutshell, it is the unwillingness to cut taxes during the boom phase at date 1 that introduces a sort of *option value of rent-seeking* which rises with economic uncertainty. This option value increases the return to savings as long as political risk is low relative to economic risk.

That is, while both the benevolent and rent-seeking government increase taxes during recessions, only the former lowers them during booms. Thus the government realizes that by saving more it protects the economy during recessions *and* it increases rents during a boom. Going back to Figure 3, we see that there is a range of economic uncertainty in which taxes do not rise during recessions when politicians are in power. This is an extreme example of the mechanism behind the option value of rent-seeking. In this case, the rise in uncertainty is accomodated with a one for one increase in savings that insulates the economy from higher taxes during recessions. However, these higher savings also translate

one for one into additional rents during the high state, since as the figure shows politicians do not cut taxes during booms.

The increasing relation between public savings and economic uncertainty turns around when political risk is high relative to economic risk (the condition in the corollary) because in such case the option value of rent-seeking most likely goes not to the current but to rival governments, in which case the rise in economic uncertainty exacerbates the incentive to starve the beast.

More formally, the marginal value of savings from economic risk is:

$$\frac{1}{2}\left(\tau_1^L + \tau_1^H\right). \tag{13}$$

In a model without rent-seeking, optimality requires that this value be equal to the marginal cost of saving which is τ_0. In a model with rent-seeking, politicians must deduct from (13) the cost of saving due to political risk:

$$-\frac{1}{2}(1-q)\,\theta. \tag{14}$$

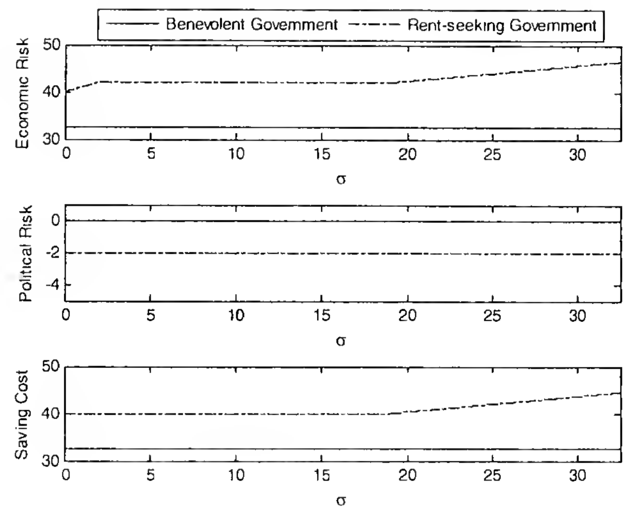
Expression (14) takes into account that an additional unit of savings represents a reallocation of rents from period 0 to period 1, that these rents may go to another government with probability $(1-q)$, and that at the margin these rents are worth θ in the event of a boom which occurs with probability 1/2.

More importantly for the region that concerns us the most—high economic and low political uncertainty (region II)—the role of political economy is not only to add the political risk term (14) to the government's calculation, but also to alter τ_1^H in (13) which is not only larger than under a benevolent government but also does not decline as the size of the boom rises. In summary, while the value of savings is reduced by the political risk term (14), it is increased by the presence of economic risk in (13) as σ increases.

Figure 4 illustrates these different effects in the benevolent and politicians' cases. The two top panels describe the values of (13) and (14) as a function of σ. The bottom panel considers the marginal cost of saving, which is equal to τ_0. [17]

[17]Note that this figure describes the *equilibrium* value of the different components of the marginal value and cost of savings. The option value of rent seeking rises monotonically with economic uncertainty for a *given* level of savings. However, in equilibrium (and hence in the figure) savings are not constant; they fall early on and then rise throughout (see Figure 1).

Figure 4: Decomposing Economic and Political Risk by Government Type



3.4 The Role of Political Institutions

We have thus far described the manner by which economic risk interacts with the rent-seeking motive of politicians to generate over-saving or under-saving by a rent-seeking government relative to a benevolent government. In this section, we disentangle the rent-seeking motive of the government into the component associated with political risk (q) and the component associated with the marginal value of rent-seeking (θ) to highlight the manner by which rent-seeking governments facing the same level of economic risk may differ among themselves in their savings behavior.

Corollary 2 *The following comparative statics apply to* A_1^p*:*

1. *It is increasing (constant) in* q *for* $\sigma > (<) \theta (1 - q) / 2$, *and*

2. *It is increasing (decreasing) in* θ *for* $\sigma > (<)\ A_0 - \overline{g} + \theta (3 - q)$.

Figure 5 considers the same economy as Figure 1 for different levels of q. It shows that for any level of economic uncertainty, a reduction in political risk (an increase in q) always weakly increases savings. The intuition for this is related to the conventional understanding of the political economy of debt whereby a reduction in political risk reduces

the incentive to starve the beast.[18]

Figure 5: Savings by Political Risk

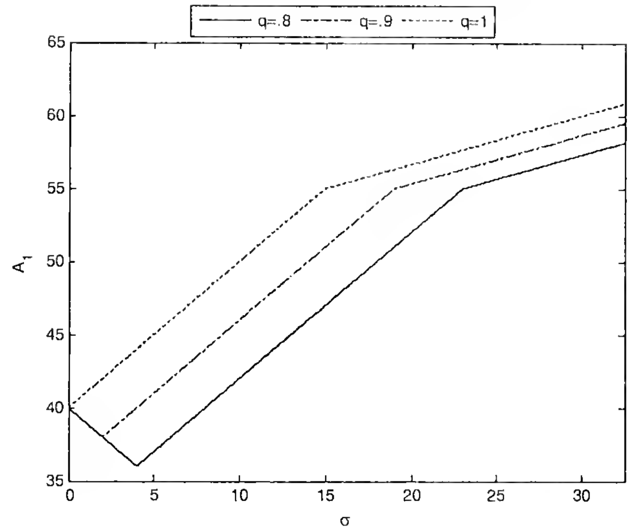


Figure 6: Savings by Marginal Value of Rent-Seeking

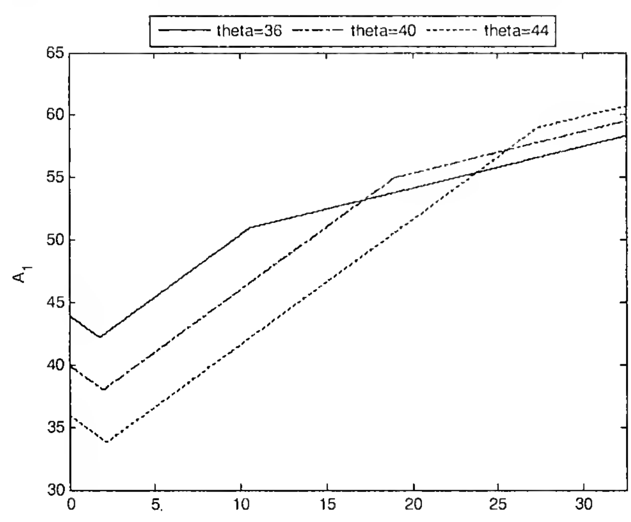


Figure 6, which considers savings for different levels of θ, reiterates the novel result achieved in our framework. For low levels of economic volatility σ, it is always the case that a high θ government saves less than a low θ government since it has a greater incentive

[18]The economy with $q = 1$ technically represents the economy as q approaches 1 from below, since there are multiple solutions associated with $q = 1$.

to starve the beast. Nevertheless, for a high enough level of σ, a high θ government saves more, since the option value or rent-seeking is sufficiently high to induce the government to inflate the beast.

3.5 Welfare, Rents, and Uncertainty

An increase in economic uncertainty lowers welfare in the benevolent planner's as well as the politicians' equilibrium. Figure 7 plots the gap between households' welfare under politicians and under the benevolent government. Since the presence of politicians is socially costly, this difference is negative throughout. Moreover, there are two related results worth highlighting. First, and as in most of the political economy literature, a decline in political risk (an increase in q) raises welfare for many parameters. However, unlike that literature, when economic risk is sufficiently high, the welfare ranking inverts, and the low q government provides *higher* welfare to households than the high q government. Second, in the region where public savings are increasing with respect to economic uncertainty (region II), the welfare gap relative to the benevolent government initially decreases with a rise in economic uncertainty but then starts increasing.

The reason for these two results is *public savings.* Initially, an increase in public savings is good but eventually the combination of low political risk and high economic uncertainty bloats too much public savings (i.e., politicians inflate the beast), and this in turn increases expected rent extraction by politicians. The latter point can be seen in Figure 8, which shows that the economic value of rent extraction, $x_0 + \frac{1}{2}x_1^H$, rises sharply once economic uncertainty becomes very significant, and for this reason, it may be better for society to face a system with high political risk, despite the incentive to starve the

beast that such governments experience.

Figure 7: Social Welfare Under Rent-Seeking Government

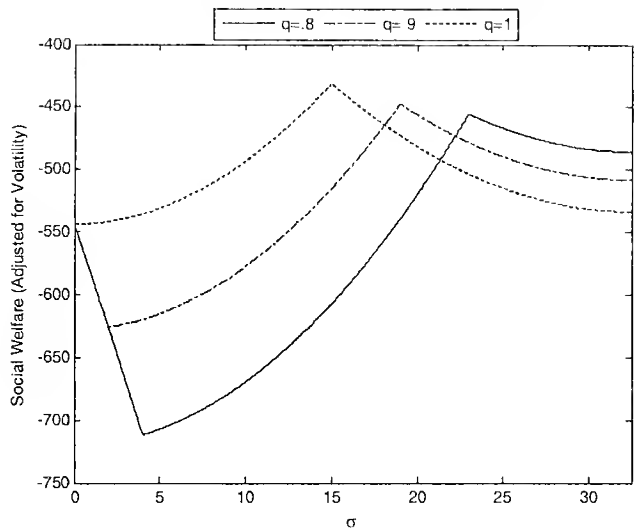
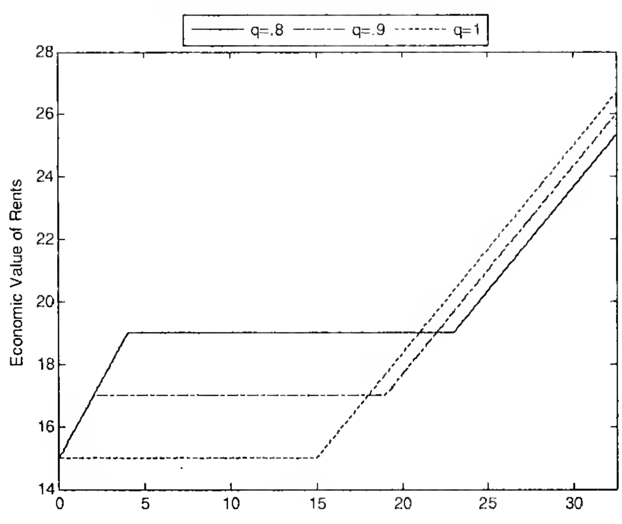


Figure 8: Economic Value of Rents



The next proposition summarizes our welfare discussion.

Proposition 3 *The following comparative statics apply*

1. *Social welfare weakly increases (decreases) in* q *if* $q < (>) \left(A_0 - \overline{g} + 3\theta - \sigma\right)/\theta$, *and*

2. *The welfare gap increases (decreases) in σ if $\sigma \notin (\in) \left[\theta(1-q)/2, A_0 - \overline{g} + \theta(3-q)\right]$.*

4 Economy with Hedging

The government's motivation to starve versus inflate the beast depends on the relative importance of political and economic risk. However, in practice the latter risk is partially endogenous. In this section we model this endogeneity by allowing the government to hedge some of the economic risk. We show that as long as political risk is low relative to *both* economic risk *and* the hedging premium, politicians save more and hedge less than benevolent governments. Nonetheless, as the hedging premium goes to zero this result is overturned, which highlights the importance of incomplete markets behind the inflate the beast and under-hedge outcomes.

4.1 Hedging Opportunities

Let us assume that in addition to A_1, the period 0 government can purchase insurance $\alpha \geq 0$ at unit price $\pi > 0$. In period 1, the government receives an insurance payment equal to α if $y = -\sigma$ and equal to $-\alpha$ otherwise. Budget constraints (6)–(8), respectively, become:

$$\begin{aligned} \tau_0 &= A_1 - A_0 + x_0 + \alpha\pi, && (15) \\ \tau_1^H &= \overline{g} - A_1 - \sigma + x_1^H + \alpha, \text{ and} && (16) \\ \tau_1^L &= \overline{g} - A_1 + \sigma + x_1^L - \alpha. && (17) \end{aligned}$$

We refer to α as the amount of hedging purchased by the government. Since this insurance has an expected value of 0, π effectively represents the hedging premium, and the economy analyzed in the previous sections corresponds to a case in which the hedging premium is arbitrarily large so that no government would ever choose to hedge. Note that an economy in which $\pi = 0$ corresponds to the complete market economy of Lucas and Stokey (1983).

The welfare of households and politicians along with the order of events remains unchanged, with the exception that the period 0 politician must now allocate savings across A_1 and α in period 0.

4.2 Optimal Policy

As a benchmark, let us first describe the actions of a benevolent government, which as we know sets $x_0 = x_1^H = x_1^L = 0$ and maximizes social welfare. As in in equation (5) from Section 2, taxes continue to follow a random walk, although the volatility of taxes now depends on the hedging premium π: Lower π's induce higher levels of hedging and lower tax volatility. The policies of the benevolent government are described in the next proposition.

Proposition 4 *If $\sigma \leq \pi \frac{\overline{g}-A_0}{2}$, the benevolent government chooses policies as described by Proposition 1. If $\sigma > \pi \frac{\overline{g}-A_0}{2}$, the benevolent government chooses policies which satisfy:*

$$\begin{aligned}
\tau_0^b &= \frac{\tau_1^{H,b}}{1-\pi} = \frac{\tau_1^{L,b}}{1+\pi} = \frac{\overline{g} - A_0 + \pi\sigma}{2+\pi^2}, \\
A_1^b &= \frac{\overline{g}\left(1+\pi^2\right) + A_0 - \pi\sigma}{2+\pi^2}, \text{ and} \\
\alpha^b &= \frac{2\sigma - \pi\left(\overline{g} - A_0\right)}{2+\pi^2}.
\end{aligned}$$

Thus, for low enough levels of economic uncertainty, the benevolent government chooses not to hedge. Eventually, however, as σ rises the government uses some of its savings to purchase hedging contracts.

4.3 Under-hedging

Now let us consider the policies chosen by politicians. Our central case is one in which $\pi > 1 - q$, so that the hedging premium is high relative to the time horizon of the government, which means that the scope for reducing exogenous economic risk is limited. Then, politicians hedge *less* than a benevolent government. Moreover, as in Proposition 2, for high enough σ and q, the politician saves more than the benevolent government. The next proposition summarizes these results:

Proposition 5 *If $\pi > 1 - q$, then*

1. *$\alpha^p = 0$ if $\sigma \leq \frac{\theta q(2+\pi)}{1-\pi} - \overline{g} + A_0$ and $\alpha^p > 0$ if $\sigma > \frac{\theta q(2+\pi)}{1-\pi} - \overline{g} + A_0$,*

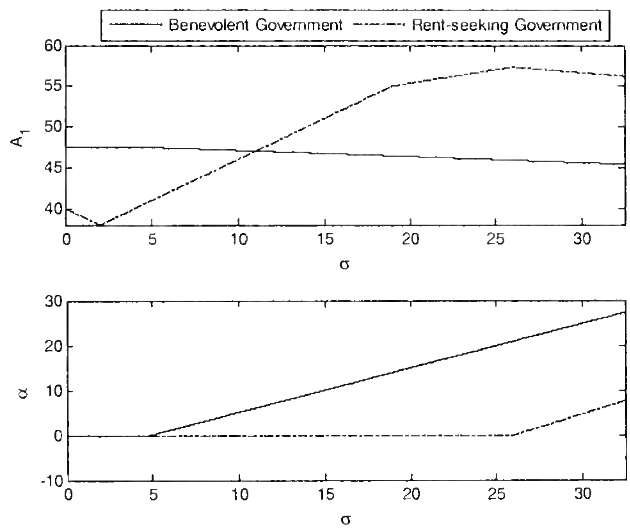
2. *$\alpha^p < \alpha^b$ if $\alpha^b > 0$, and*

3. *$A_1^p > (<)\, A_1^b$ if $\sigma > (<)\, \theta\left(2-q\right) - \frac{\overline{g}-A_0}{2}$.*

The reason for depressed hedging is that postponed rent-extraction serves as a *substitute* for hedging.

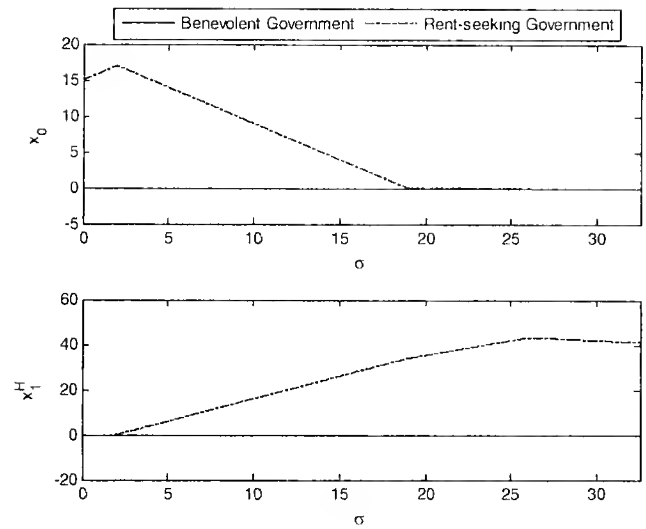
The statements of the proposition are illustrated in Figures 9 and 10, which are analogous to Figures 1 and 2 with the exception that Figure 9 adds the level of hedging α as a function of volatility σ.[19] It is apparent in them that as σ increases, politicians backload rent-extraction and save more. The high savings lower the value of hedging for politicians, who only start hedging at very high levels of economic uncertainty.

Figure 9: Savings and Hedging



[19]The parameters are chosen as before with $\pi = .15$.

Figure 10: Rents



To understand the under-hedging result, note that the marginal value of hedging from economic risk is:

$$\frac{1}{2}\left(\tau_1^L - \tau_1^H\right), \tag{18}$$

since an additional unit of insurance translates into a reduction in tax volatility in the form of lower taxes in a downturn and higher taxes in a boom. In a model without politicians, optimality (at an interior) requires that this value be equal to the marginal cost of hedging which is $\pi\tau_0$. In a model with political economy, politicians must *add* to (18) the benefit of hedging due to the *reduction* of political risk:

$$\frac{1}{2}(1-q)\,\theta. \tag{19}$$

Expression (19) takes into account that an additional unit of hedging (versus saving) represents a reallocation of rents from the boom in period 1 to period 0. These rents may go to another government with probability $(1-q)$, and at the margin these rents are worth θ in the event of a boom which occurs with probability 1/2. Note that (19) takes the opposite sign as (14) since hedging ties the hands of the government during a boom whereas savings increases the scope for rent-seeking during a boom.

Political economy not only adds the political risk term (19) to the government's calculation (which increases the value of hedging), but also raises τ_1^H in (18) (which reduces the value of hedging). If political risk is sufficiently low relative to the price of hedging, the latter effect outweighs the former, so that politicians under-hedge relative to the

benevolent government.

4.4 On the Importance of Incomplete Markets

We have highlighted thus far how the presence of economic risk reverses the traditional understanding of the political economy of debt. Rather than under-saving, politicians facing sufficient levels of economic risk over-save relative to a benevolent government. If costly hedging is available, this insight also manifests itself into lower hedging (in exchange for more uncontingent savings) by politicians relative to the social optimum.

In this section we highlight how our insights depend on the sufficient incompleteness of financial markets. Specifically, consider what happens as the hedging premium π declines. It turns out that there is a critical level $1-q$, such that if π drops below this value, the previous results are overturned and the traditional intuitions related to starve the beast are upheld.[20] We discuss this region next.

Proposition 6 *If $\pi < 1-q$, then*

1. $\alpha^p = 0$ *if* $\sigma < \pi\frac{\theta}{2}$, *and* $\alpha^p > 0$ *if* $\sigma > \pi\frac{\theta}{2}$,

2. $\alpha^p > \alpha^b$ *if* $\alpha^p > 0$ *and* $\theta < \overline{g} - A_0$, *and*

3. $A_1^p < A_1^b$.

If $\pi < 1-q$, then $x_1^{H,p} = 0$ since it is cheaper for politicians to use the hedging instrument as opposed to contingent rent-seeking in order to reduce the volatility of taxes. The existence of politicians therefore implies a novel role for hedging. It serves its usual purpose as a buffer for downturns (i.e., it reduces economic risk), but it also allows the government to frontload whatever rents it could acquire during a future boom and hence it also reduces political risk. That is, the possibility for hedging economic risk disentangles the dual role for savings driving the overaccumulation of savings when markets are incomplete. Put differently, hedging economic risk also serves as proxy-hedging for political risk.

If political risk is large enough that the benefit from hedging due to the reduction in political risk (19) is high, then a low hedging premium overturns the results we emphasize in the main text. In this case, politicians under-save and over-hedge.

[20] There is a continuum of solutions at the boundary $q = 1-\pi$.

5 Fiscal Rules

In the previous sections we highlighted how the presence of politicians can cause government policies to differ substantially from those of a benevolent government. This policy-gap clearly imposes welfare costs on households which could be reduced if politicians were somehow constrained in the policies they can implement.

Why would politicians currently in power ever accept such constraints? Because of political risk. Recall from Section 3 that date 0 politicians cannot control policies chosen by politicians in period 1. Consequently, taxes are not cut during a boom, although this would have been the preferred policy outcome of the period 0 politician if a different government is in power at date 1 (political risk). Therefore, if society can impose fiscal rules on the politician in period 1 to ensure that taxes are cut when economic conditions allow it, then the period 0 politician may be willing to sacrifice some rents in exchange for this policy commitment. In this section we describe a set of welfare enhancing rules that are acceptable to current politicians. One implementation of such rules takes the form of simple contingent tax caps. We also show that the typical fiscal rules used in practice are suboptimal since they fail to lower taxes during booms.

5.1 Optimal Rules

Let us define W^p as the welfare of the period 0 politician in the absence of rules, as described in Sections 3 and 4. Then the optimal incentive compatible fiscal rules we consider are associated with the solution to the following problem:

$$\max_{\tau_0, x_0, A_1, \alpha, \tau_1^H, \tau_1^L, x_1^H, x_1^L} \mathrm{E}_0 \left(-\frac{\tau_0^2}{2} - \frac{\tau_1^2}{2} \right) \tag{20}$$

$$\text{s.t.}$$

$$\mathrm{E}_0 \left(-\frac{\tau_0^2}{2} - \frac{\tau_1^2}{2} + \theta x_0 + q\theta x_1 \right) \geq W^p, \tag{21}$$

$$(15) - (17)\,, \text{ and } \tau_0, x_0, \tau_1^H, \tau_1^L, x_1^H, x_1^L \geq 0. \tag{22}$$

The solution to this program represents a set of policies which improve household welfare while leaving politicians at least as well off as they would be in the absence of fiscal rules. We denote the solution to (20) – (22) with a superscript r.[21]

Proposition 7 *The solution to* (20) – (22) *satisfies the following properties:*

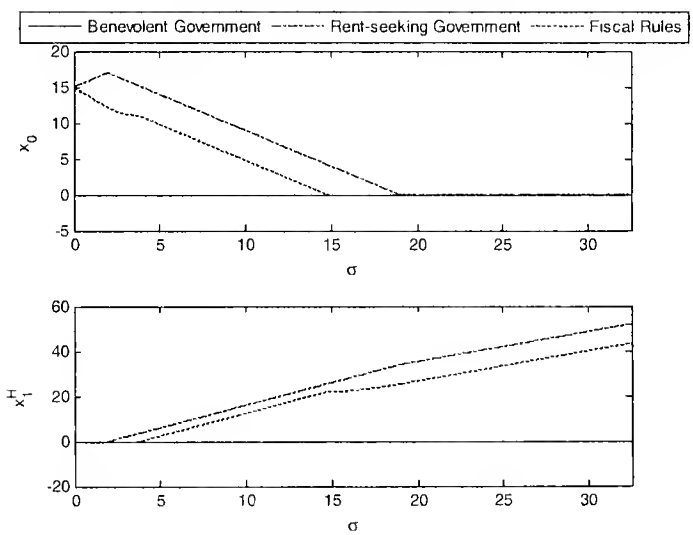
[21] Note that much like financial contracts, policies under rules are not allowed to depend on the realization of political uncertainty in our economy.

1. $\tau_0^r = \frac{\tau_1^{H,r}}{(1-\Delta)} = \frac{\tau_1^{L,r}}{(1+\Delta)}$ *for some* $0 \leq \Delta \leq \sigma/\tau_0^r$, *and*

2. $x_0^r + \frac{1}{2}x_1^{H,r} \leq x_0^p + \frac{1}{2}x_1^{H,p}$.

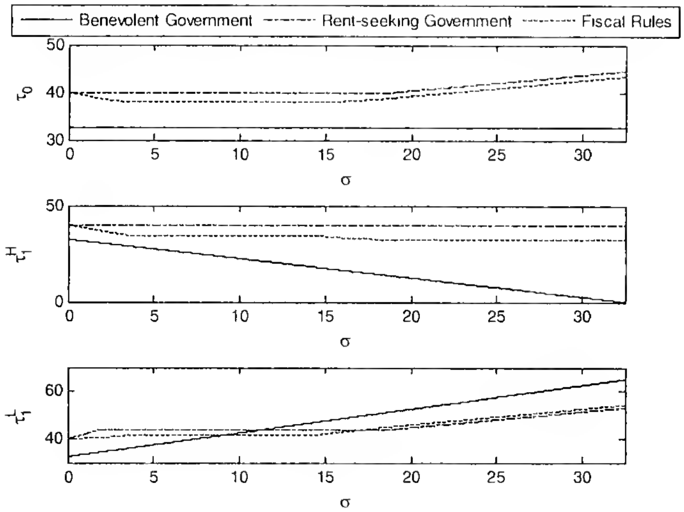
By reducing $x_1^{H,p}$, date 1 politicians now cut taxes during booms and along the way restore the random walk property of taxes exhibited by the benevolent government. These changes represent a welfare gain for the current government as long as it faces political risk. This gain creates space for tax cuts and rent reduction at date 0 as well. Figures 11 and 12 illustrate these effects in the economy studied in Section 3.[22]

Figure 11: Rents ($\pi = 1$)



[22] This is a special case of the economy in Section 4 with $\pi = 1$.

Figure 12: Taxes ($\pi = 1$)

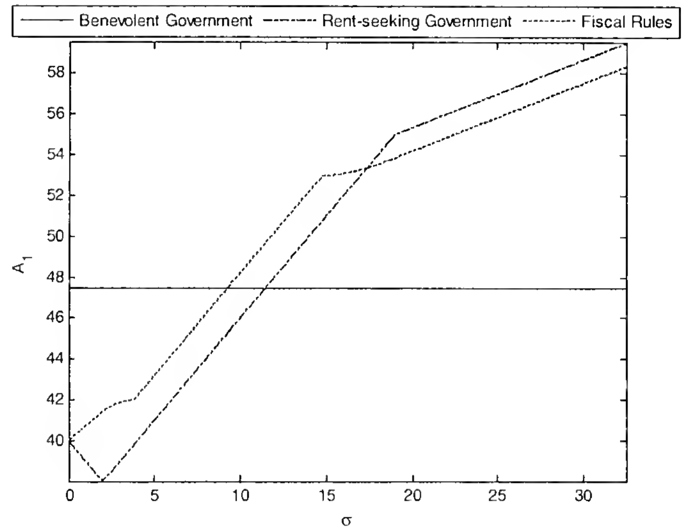


The counterpart of these tax and rent cuts is the behavior of public savings, shown in Figure 13. These savings rise relative to the rule-less economy for low levels of economic uncertainty and fall for high levels. That is, the rules partially alleviate both the starve and the inflate the beast problems, as least in the extreme regions of economic uncertainty. Note that the presence of incentive compatibility constraints implies that the general shape of savings as a function of economic uncertainty shares much in common with the rule-less economy.

One can interpret our results in light of the discussion of Section 3.3. Under fiscal rules, on one hand an additional unit of savings continues to serve the purpose of reducing economic risk (13). However, the cost of political risk (14) no longer enters the government's calculations since rules are chosen so as to constrain the period 1 politician into utilizing any additional units of savings (on the margin) for tax reduction in downturns *as well as in booms*. On the one hand, the alleviation of political risk (14) serves to increase the marginal value of savings to the government. On the other hand, the implied reduction in τ_1^H in (13) relative to the rule-less economy serves to reduce the marginal value of savings to the government. For low values of economic risk, the former force outweighs the latter, and rules imply higher levels of savings than in the rule-less economy, since they counteract politicians' tendency to starve the beast. For high values of economic risk, the latter force outweighs the former, and rules imply lower levels of

savings, since they counteract politicians' tendency to inflate the beast.

Figure 13: Savings ($\pi = 1$)



We can see in Figure 14 that the economic value of rents $x_0 + \frac{1}{2}x_1^H$ declines substantially with rules, especially at intermediate levels of economic uncertainty. However, since the politician must not be worse off under rules, the counterpart of this decline in rents is an increase in taxpayers welfare, which is illustrated in Figure 15 which depicts the welfare gap with a benevolent government.

Figure 14: Economic Value of Rents ($\pi = 1$)

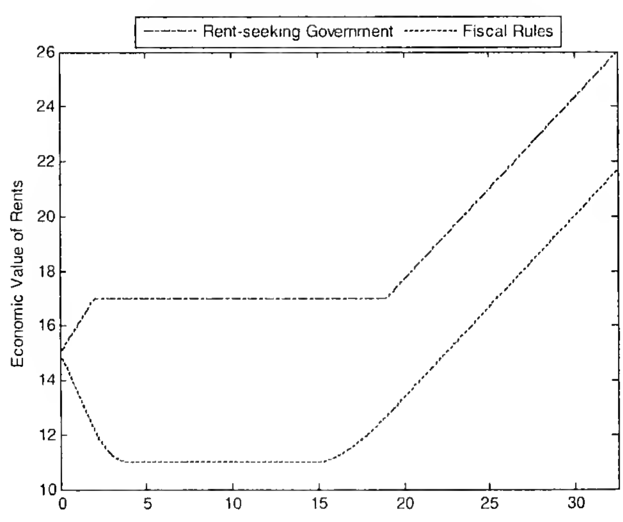
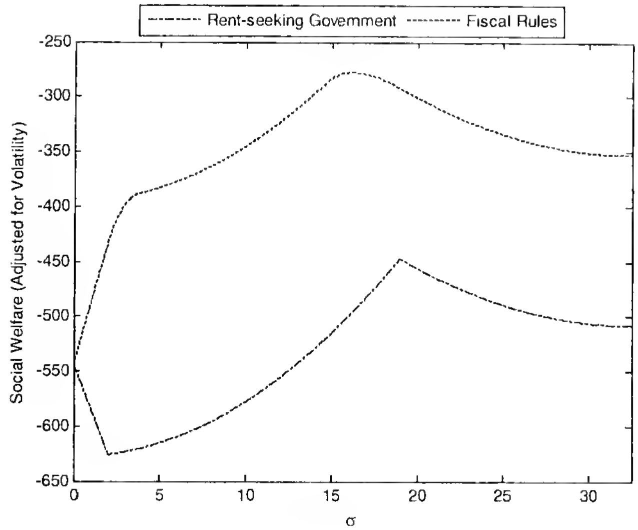


Figure 15: Social Welfare ($\pi = 1$)

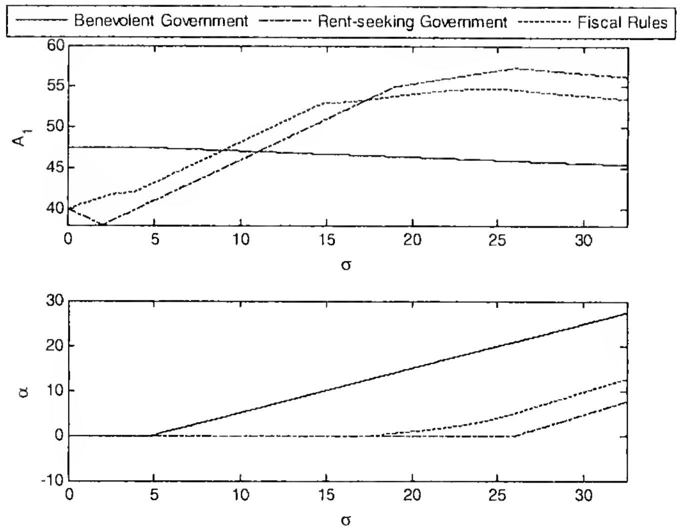


Note that there is no gain from rules if there is no economic uncertainty ($\sigma = 0$). The reason is that in such case all rent extraction is frontloaded to date 0 and there is no economic motive for cutting taxes during the boom, which means that there is no constraint on date 1 governments that can increase the date 0 politician's welfare. There is an entirely analogous result, which we do not show here for brevity, when there is no political risk ($q = 1$). In such case the date 0 government is also the date 1 government, and hence there are no concessions by future governments that can improve the current government's welfare (i.e., there is no time-inconsistency problem for the period 0 politician).

Figure 16 explores the implications of rules for the level of hedging in an economy in which (expensive) hedging opportunities are available. The main new result is in the second panel, which shows that under rules, the government starts hedging at lower levels of economic uncertainty than in the case without rules. This increase in hedging compensates for the lower savings induced by the rule when economic uncertainty is high. More specifically, the presence of rules reduces τ_1^H in (18) so as to increase the economic benefit of hedging, but also makes the value of hedging in reducing political risk (19) less relevant on the margin. For high values of economic uncertainty, economic risk (18) dominates, inducing the government under rules to hedge more than in the rule-less

economy.[23]

Figure 16: Savings and Hedging $(1 - q < \pi < 1)$



Given the general characterization in Proposition 7, the question arises of what types of rules would the period 0 politician accept which could improve the welfare of households? The next proposition shows that simple rules which constrain the size of taxes can induce the optimal incentive compatible policy. Specifically, consider the following constraints:

$$\tau_0 \leq \tau_0^r \tag{23}$$

$$\tau_1^H \leq \tau_0^r(1-\Delta) \tag{24}$$

$$\tau_1^L \leq \tau_0^r(1+\Delta) \tag{25}$$

Now imagine if the period 1 politician is free to choose any policy as long as it satisfies (24) and (25). Furthermore, imagine if in choosing A_1 and α, the period 0 politician must ensure that these choices make it possible for the period 1 politician to satisfy (24) and (25). Furthermore, the period 0 politician must satisfy (23). We can show that these constraints lead to the same welfare as that under the solution to (20) – (22).

Proposition 8 *Under rules* (23) – (25), *politician's strategies correspond to the solution to* (20) – (22).

[23] Recall that if the hedging premium is very low, $\pi < 1 - q$, the economy with politicians frontloads rent extraction and hedges potentially more than the benevolent government. In this region the optimal fiscal rule *lowers* hedging. We omit this case from the main text since our central concern in the paper is with relatively incomplete markets.

Rules which constrain the size of taxes can serve to make the period 0 politician as well off and household strictly better off. If a fiscal constitution is possible, politicians and households have an incentive for implementing it since it can make both parties strictly better off.

5.2 Suboptimal Rules (Used in Practice)

In practice, rules take a different form by imposing a lower bound on the government's primary surplus:

$$\tau_0 - x_0 \geq \underline{s}_0, \tag{26}$$

$$\tau_1^H - x_1^H - \overline{g} \geq \underline{s}_1^H, \text{ and} \tag{27}$$

$$\tau_1^L - x_1^L - \overline{g} \geq \underline{s}_1^L. \tag{28}$$

The motivation for such rules is to provide incentives for governments to save in order to ensure that they repay their debts. A natural question is whether such rules can improve efficiency in our context in which the issue at hand is not debt overhang but to manage abundance. In the context of our model, (27) and (28) provide motivation for less savings by the period 0 politician, whereas (26) provides motivation for more savings and potentially more hedging. Whatever the direction of the overall effect, this rule does not put an upper bound on taxes, so that in equilibrium taxes always exceed the marginal product of rents θ. Consequently, social welfare cannot reach the level under the rules described in Proposition 8 in this circumstance.[24] The next proposition states these results.

Proposition 9 *Under rules* (26) – (28), *politician's strategies induce* $\tau_0, \tau_1^L, \tau_1^H \geq \theta$ *and do not correspond to the solution to* (20) – (22).

6 Final Remarks

The building insight of this paper is that the combination of economic uncertainty and rent-seeking behavior by politicians gives rise to an *option value of rent-seeking* mechanism which raises the expected future return from public savings as uncertainty rises.

Whether this option value of rent-seeking leads to less or more savings depends on who benefits from its return. If economic risk is low relative to political risk, then the current

[24] In our context, (26) – (28) are generally not incentive compatible since they only constrain the period 0 politician.

government expects other governments to benefit from it and is inclined to cut savings and *starve the beast*. However, if economic risk is high relative to political risk then the opposite happens and the current government raises savings above what a benevolent government would do. That is, the government *inflates the beast*. This theoretical result serves as a potential explanation for the pattern displayed in Table 1 whereby high rent-seeking governments over-save relative to low rent-seeking governments in the sample of countries that are highly exposed to commodity price shocks.

Another widespread pattern is the government's strong bias toward self-insurance rather than hedging economic uncertainty. We show that this is simply the counterpart of the inflate the beast result when markets are sufficiently incomplete (i.e., when hedging is expensive). The reason is that the retained rents in public savings, while costly from the point of view of high average taxes, have the side benefit of providing low cost insurance.

Finally, yet another increasingly prevalent practice is the adoption of fiscal rules integrated to the underlying stabilization funds. We argue that this widely praised mechanism is likely to be suboptimal, as it does not address one of the fundamental problems of the environment we describe, which is that of high taxes during booms.

7 Appendix

Explanation of Data

We describe in this section the data behind Table 1. Surplus to GDP ratio in 2006 is calculated using statistics from the CIA World Factbook (2007) which is preferred to other sources since it maximizes the available cross-section of countries. In order to categorize countries into high and low rent-seeking countries, we use constraint on the executive for a given country in 2004 from the Polity IV dataset, the rule of law index in 2004, and the control of corruption index in 2004, the last two variables being from Kaufmann, Kraay, and Mastruzzi (2005). A country is classified as high rent-seeking if any of these indicators places the country in the bottom 33rd percentile of the sample. In order to categorize countries into high and low fiscal volatility countries, we use fuel exports as a fraction of GDP and ore exports as a fraction of GDP for a given country which are the averages for available years in 2000 to 2005 and are from the World Development Indicators (2007). If fuel and ore export data is available, a country is classified as experiencing high fiscal volatility if it is in the top 25th percentile in fuel exports or alternatively if it is in the top 25th percentile in ore exports. If neither of these conditions is satisfied, then the country is classified as experiencing low fiscal volatility. There is a small group of countries for which fuel and ore export data is unavailable, and from these, we classify OPEC countries, the Republic of Congo, and Equatorial Guinea as high fiscal volatility countries since they are known to be significant exporters of oil. The data is summarized in Appendix Table A1.

Proof of Proposition 1

Let μ_0, $\frac{1}{2}\mu_1^H$, and $\frac{1}{2}\mu_1^L$ represent the Lagrange multipliers on (1), (2), and (3), respectively. First order conditions yield:

$$\begin{aligned}
\tau_0 &: \tau_0 = \mu_0, \\
\tau_1^H &: \tau_1^H = \mu_1^H, \\
\tau_1^L &: \tau_1^L = \mu_1^L, \text{ and} \\
A_1 &: \mu_0 = \frac{1}{2}\mu_1^H + \frac{1}{2}\mu_1^L.
\end{aligned}$$

Combining these first order conditions, we achieve (5) which yields the solution. The non-negativity constraint on taxes is satisfied by Assumption 1. **Q.E.D.**

Proof of Lemma 1

If the state is H, the period 1 politician chooses τ_1^H and x_1^H to maximize (9) subject to (7) and $\tau_1^H, x_1^H \geq 0$. First order conditions imply that $\tau_1^H = \theta$ if $x_1^H > 0$ and $\tau_1^H > \theta$ otherwise which leads to the solution. Analogous arguments hold if the state is L. **Q.E.D.**

Proof of Proposition 2

Combine (6), (7), and (8) together with Lemma 1, to rewrite the politician's problem:

$$\max_{\tau_0, x_0, \tau_1^H, \tau_1^L, x_1^H, x_1^L} -\frac{1}{2}\tau_0^2 - \frac{1}{4}\tau_1^{H^2} - \frac{1}{4}\tau_1^{L^2} + \theta\left(x_0 + q\left(\frac{1}{2}x_1^H + \frac{1}{2}x_1^L\right)\right) \tag{29}$$

s.t.

$$A_0 - \overline{g} + \tau_0 + \frac{1}{2}\tau_1^H + \frac{1}{2}\tau_1^L - x_0 - \frac{1}{2}x_1^H - \frac{1}{2}x_1^L = 0, \tag{30}$$

$$\tau_1^L - \sigma - x_1^L = \tau_1^H + \sigma - x_1^H, \tag{31}$$

$$\tau_1^H \geq \theta, \tag{32}$$

$$x_0 \geq 0, \tag{33}$$

$$x_1^H \geq 0, \text{ and} \tag{34}$$

$$x_1^L \geq 0. \tag{35}$$

It will be apparent from the solution here and in all future proofs that Lemma 1 is satisfied by the solution to this program. Let $\mu_0, \mu_1, \varphi, \phi_0, \frac{1}{2}\phi_1^H$, and $\frac{1}{2}\phi_1^L$ represent the Lagrange multipliers for constraints (30) – (35), respectively. First order conditions yield:

$$\tau_0 \; : \; \tau_0 = \mu_0, \tag{36}$$

$$\tau_1^H \; : \; \tau_1^H = \mu_0 - \mu_1 + \varphi, \tag{37}$$

$$\tau_1^L \; : \; \tau_1^L = \mu_0 + \mu_1, \tag{38}$$

$$x_0 \; : \; \mu_0 = \theta + \phi_0, \tag{39}$$

$$x_1^H \; : \; \mu_0 - \mu_1 = q\theta + \phi_1^H, \text{ and} \tag{40}$$

$$x_1^L \; : \; \mu_0 + \mu_1 = q\theta + \phi_1^L. \tag{41}$$

$\mu_1 \geq 0$ from (37), (38), and Lemma 1. Moreover, $\phi_1^L > 0$ and $x_1^L = 0$. If this is not the case then $\mu_1 = 0$ from (40) and (41), which implies that $\mu_0 = q\theta$ but which contradicts (39) since $q < 1$. Since $\tau_0, \tau_1^H, \tau_1^L \geq \theta$ from (36) – (39), then Assumption 2 and (30) imply that it is not possible for $x_0 = x_1^H = 0$. From Lemma 1, (36), (37), and (39), this implies that $\tau_1^H = \theta$. We characterize three cases and then perform comparative statics with respect to A_1^p.

Case 1: $x_0 > 0$ and $x_1^H = 0$. (36) and (39) imply that $\tau_0 = \theta$. From (31), $\tau_1^L = \theta + 2\sigma$,

which implies that $A_1^p = \overline{g} - \theta - \sigma$. By Assumption 2, $A_1^p < A_1^b$. From (36) and (38), $\mu_1 = 2\sigma$, so that (40) requires $\sigma \leq \theta(1-q)/2$. From Assumption 2, $\theta(1-q)/2 < \theta(2-q) - \frac{\overline{g}-A_0}{2}$.

Case 2: $x_0 > 0$ and $x_1^H > 0$. (36) and (39) imply that $\tau_0 = \theta$. From (36), (38), and (40), $\tau_1^L = \theta(2-q)$, so that $A_1^p = \overline{g} + \sigma - \theta(2-q)$, which means that $A_1^p > (<) A_1^b$ if $\sigma > (<) \theta(2-q) - \frac{\overline{g}-A_0}{2}$. It is necessary that $\sigma > \theta(1-q)/2$ since the alternative implies that $\tau_1^L > \theta + 2\sigma$ which contradicts (31). Satisfaction of (33) requires $\sigma < A_0 - \overline{g} + \theta(3-q)$ given (30) and (31).

Case 3: $x_0 = 0$ and $x_1^H > 0$. (36), (38), and (40) imply that $\tau_1^L = 2\tau_0 - \theta q$. Combining (30) and (31) to solve for τ_0 and x_1^H implies that $A_1^p = (\overline{g} + \sigma + 2A_0 + \theta q)/3$. This means that $A_1^p > (<) A_1^b$ if $\sigma > (<) \frac{\overline{g}-A_0}{2} - \theta q$. For this case to hold, it is necessary that the implied value of τ_0 exceeds θ for (36) and (39) to hold, and this implies from substitution into (30) that $\sigma > A_0 - \overline{g} + \theta(3-q)$ which exceeds $\theta(1-q)/2$ by Assumption 2. By Assumption 2, this implies that $\sigma > \frac{\overline{g}-A_0}{2} - \theta q$, so that $A_1^p > A_1^b$. **Q.E.D.**

Proof of Corollary 1

This follows from the solution described in the proof of Proposition 2. **Q.E.D.**

Proof of Corollary 2

This follows from the solution described in the proof of Proposition 2. **Q.E.D.**

Proof of Proposition 3

From the proof of Proposition 2, $\tau_1^{H,p} = \theta$ and

$$\tau_0^p = \begin{cases} \theta & \text{if } q \leq 1 - 2\sigma/\theta \\ \theta & \text{if } 1 - 2\sigma/\theta \leq q \leq (A_0 - \overline{g} + 3\theta - \sigma)/\theta \\ (\overline{g} + \sigma - A_0 + \theta q)/3 & \text{if } q \geq (A_0 - \overline{g} + 3\theta - \sigma)/\theta \end{cases}, \text{ and}$$

$$\tau_1^{L,p} = \begin{cases} \theta + 2\sigma & \text{if } q \leq 1 - 2\sigma/\theta \\ \theta(2-q) & \text{if } 1 - 2\sigma/\theta \leq q \leq (A_0 - \overline{g} + 3\theta - \sigma)/\theta \\ (2(\overline{g} + \sigma - A_0) - \theta q)/3 & \text{if } q \geq (A_0 - \overline{g} + 3\theta - \sigma)/\theta \end{cases}.$$

It is clear that for $q \leq (A_0 - \overline{g} + 3\theta - \sigma)/\theta$, social welfare is increasing in q. If $q \geq (A_0 - \overline{g} + 3\theta - \sigma)/\theta$, social welfare is

$$-(\overline{g} + \sigma - A_0)^2/6 - (\theta q)^2/12 - \theta^2/4 \tag{42}$$

which is decreasing in q. In order to evaluate the welfare cost of political economy, note that welfare under a benevolent government is equal to $-(\overline{g} - A_0)^2 - \sigma^2/2$. If

$\sigma < \theta(1-q)/2$, then social welfare under politicians is equal to $-\theta^2 - \theta\sigma - \sigma^2$, so that the welfare cost of political economy is increasing in σ. If $\theta(1-q)/2 < \sigma < A_0 - \overline{g} + \theta(3-q)$, then social welfare under politicians is independent of σ, so that the welfare cost of political economy is declining in σ. If $\sigma > A_0 - \overline{g} + \theta(3-q)$, from (42) and Assumption 1, the welfare cost increases in σ. **Q.E.D.**

Proof of Proposition 4

Write the program as in the Proof of Proposition 1 with the modified budget constraints, letting κ represent the Lagrange multiplier for the non-negativity constraint on α. The additional first order condition is

$$\alpha : \pi\mu_0 = \frac{1}{2}\mu_1^L - \frac{1}{2}\mu_1^H + \kappa. \tag{43}$$

If $\alpha = 0$, then the solution corresponds to that under Proposition 1 and (43) implies that $\sigma \leq \pi\frac{\overline{g}-A_0}{2}$. If $\alpha > 0$, then (5) and (43) imply the solution by substitution, and this requires $\sigma > \pi\frac{\overline{g}-A_0}{2}$ in order for the implied value of α to be positive. **Q.E.D.**

Proof of Proposition 5

Trite the program as in the proof of Proposition 2 with modified budget constraints, adding $-\alpha\pi$ to the left hand side of (30) and 2α to the left hand side of (31), where we let κ represent the Lagrange multiplier for the non-negativity constraint on α. The additional first order condition is

$$\alpha : \pi\mu_0 = \mu_1 + \kappa. \tag{44}$$

The same arguments as in the proof of Proposition 2 imply that $x_1^L = 0$ since Lemma 1 with $\widetilde{y} = \{-\sigma + \alpha, \sigma - \alpha\}$ substituted in for y applies given that optimality requires $\alpha \leq \sigma$. Imagine if $x_0 = x_1^H = 0$. This can only be true if $\alpha > 0$ by the proof of Proposition 2. (44) combined with (36) – (38) can be substituted into (31), to achieve $\alpha = \sigma - \frac{\tau_1^L - \tau_1^H}{2}$ and $\tau_1^L = \tau_0(1+\pi)$. Substitution into (30) yields:

$$A_0 - \overline{g} + 2\tau_0 + \pi\tau_0 - \pi\sigma = 0,$$

which by the fact that $\tau_0 \geq \theta$ from (36) and (39) violates Assumptions 1 and 2. From Lemma 1, (36), (37), and (39), this implies that $\tau_1^H = \theta$. We characterize the three cases analogously to the proof of Proposition 2.

Case 1: $x_0 > 0$ and $x_1^H = 0$. Imagine if $\alpha > 0$. Since $\tau_0 = \mu_0 = \theta$ from (36) and (39), substitution of (44) into (40) contradicts $q > 1 - \pi$. The solution is therefore identical to

that in case 1 of the proof of Proposition 2.

Case 2: $x_0 > 0$ and $x_1^H > 0$. Analogous arguments to those of case 1 imply that $\alpha = 0$ and that the solution is identical to that in case 2 of the proof of Proposition 2.

Case 3: $x_0 = 0$ and $x_1^H > 0$. The solution coincides with that of case 3 in the proof of Proposition 2 if analogous arguments to cases 1 and 2 hold. By (40), this occurs if $q\theta > \tau_0(1-\pi)$, which after substitution of the implied solution for τ_0 occurs if $\sigma \leq \frac{\theta q(2+\pi)}{1-\pi} - \overline{g} + A_0$. If instead $\sigma > A_0 - \overline{g} + \frac{\theta q(2+\pi)}{1-\pi}$, then $\sigma > A_0 - \overline{g} + \theta(3-q)$ since $q > 1-\pi$, so that the economy is necessarily in case 3 and $\alpha > 0$, establishing the first part of the proof. (36), (38), (40), and (44) imply that $\tau_0 = \theta q/(1-\pi)$ and $\tau_1^L = \theta q(1+\pi)/(1-\pi)$, so that by substitution into (30) and (31), we achieve $\alpha^p = \frac{\overline{g}+\sigma-A_0-\theta q(2+\pi)/(1-\pi)}{1-\pi}$. Imagine if $\alpha^p \geq \alpha^b$ if $\alpha^b > 0$. By some algebra, this would imply that

$$(\sigma\pi + \overline{g} - A_0)\left(\frac{1}{2+\pi^2}\right) \geq \frac{\theta q}{1-\pi}. \tag{45}$$

The left hand side of (45) increases in π since $\alpha^b > 0$. By Assumption 1 and the fact that $\alpha^b > 0$, $\pi < 1$ so that the left hand side of (45) is maximized at $\pi = 1$, but this contradicts Assumptions 1 and 2 and the fact that $q > 1-\pi$. To verify that $A_1^p > A_1^b$ if $\sigma > \theta(2-q) - \frac{\overline{g}-A_0}{2}$, this need only be checked for case 3 for $\sigma > \frac{\theta q(2+\pi)}{1-\pi} - \overline{g} + A_0$, since it is otherwise proved in the proof of Proposition 2. This follows from (31), the fact that $\alpha^b \geq \alpha^p$, and the fact that $\tau_1^{L,b} \geq \tau_1^{L,p}$ by Assumption 2 and since $q > 1-\pi$. **Q.E.D.**

Proof of Proposition 6

Follow the same initial steps as in the proof of Proposition 5. Imagine if $x_1^H > 0$. This violates (36), (39), (40), and (44). Therefore, $x_0 > 0$ and from (36) and (39), $\tau_0 = \theta$. If $\alpha = 0$, the solution is identical to that in case 1 of the proof of Proposition 2. In order for (44) to hold, this requires $\sigma \leq \pi\frac{\theta}{2}$. If $\alpha > 0$, then (38) and (44) imply that $\tau_1^L = \theta(1+\pi)$, which by substitution into (30) and (31) implies that $\alpha = \sigma - \pi\theta/2$ and $A_1 = \overline{g} - \theta(1+\pi/2)$. We determine conditions under which $\alpha^p > \alpha^b$ when $\alpha^p > 0$. Since $\sigma > \pi\frac{\theta}{2}$, by Proposition 2, the additional requirement for this to be true is that $\theta < \overline{g} - A_0$. Finally, we verify that $A_1^p < A_1^b$. If $\alpha^p = \alpha^b = 0$, then this follows from Assumption 2. If $\alpha^p = 0$ but $\alpha^b > 0$, then this implies that $\pi(\overline{g} - A_0)/2 < \sigma < \pi\theta/2$, so that $\theta > \overline{g} - A_0$ which together with the fact that $\pi < 1$ implies that $A_1^p < A_1^b$ by Assumptions 1 and 2. If $\alpha^p > 0$, then this follows from Assumptions 1 and 2. **Q.E.D.**

Proof of Proposition 7

This program is identical to that of the previous sections with the exception that constraint (32) is ignored and replaced with constraint (21). Let λ represent the Lagrange multiplier on constraint (21). First order conditions yield

$$\tau_0 \;:\; (1+\lambda)\tau_0 = \mu_0, \tag{46}$$

$$\tau_1^H \;:\; (1+\lambda)\tau_1^H = \mu_0 - \mu_1, \tag{47}$$

$$\tau_1^L \;:\; (1+\lambda)\tau_1^L = \mu_0 + \mu_1, \tag{48}$$

$$x_0 \;:\; \mu_0 = \lambda\theta + \phi_0, \tag{49}$$

$$x_1^H \;:\; \mu_0 - \mu_1 = \lambda q\theta + \phi_1^H, \tag{50}$$

$$x_1^L \;:\; \mu_0 + \mu_1 = \lambda q\theta + \phi_1^L, \text{ and} \tag{51}$$

$$\alpha \;:\; \pi\mu_0 = \mu_1 + \kappa. \tag{52}$$

The first part of the proposition follows from (46) – (48) and the fact that $\mu_1 \geq 0$. If instead $\mu_1 < 0$, then (50) and (51) imply that $x_1^L \geq x_1^H = 0$. From (47) and (48), this implies that $\tau_1^L < \tau_1^H$, but this violates (31). From (50) and (51), if $x_1^L > 0$, then $\mu_1 = 0$, but this violates (49) since $q < 1$. The second part of the proposition in the case that $\alpha^p = 0$ follows from (30) and the fact that from (46) – (48), $\tau_0^r + \frac{1}{2}\tau_1^{H,r} + \frac{1}{2}\tau_1^{L,r} = 2\frac{\lambda\theta}{1+\lambda} \leq 2\theta < \tau_0^p + \frac{1}{2}\tau_1^{H,p} + \frac{1}{2}\tau_1^{L,p}$, where we have used the analyses of Propositions 2, 5, and 6. If $\alpha^p > 0$, then the solution described in the proofs of Propositions 5 and 6 implies that $\tau_0^p + \frac{1}{2}\tau_1^{H,p} + \frac{1}{2}\tau_1^{L,p} - \alpha^p\pi \geq 2\theta$ which follows from Assumptions 1 and 2, so that analogous reasoning holds. **Q.E.D.**

Proof of Proposition 8

There exists a policy associated with the solution to (20) – (22) which the politician can choose which satisfies (23) – (25). Imagine if the politician chose a different policy with different taxes. Then households would necessarily be better off than under the solution to (20) – (22) since taxes would be lower. Moreover, by definition of the solution to (20) – (22) the period 0 politician would achieve a welfare strictly below W^p. Therefore, the politician does not choose different taxes. **Q.E.D.**

Proof of Proposition 9

Lemma 1 applies here, and it is the responsibility of the period 0 politician to ensure that the policies induced by (11) and (12) satisfy (27) and (28). This means that $\tau_1^H \geq \theta > \tau_1^{H,r}$ and $\tau_1^L \geq \theta$. Moreover, $\tau_0 \geq \theta > \tau_0^r$ by similar arguments to those in the proof of Proposition 2. **Q.E.D.**

Appendix Table A1

Country	Surplus/ GDP	High Rent-Seeking	High Fiscal Uncertainty
Afghanistan	-0.033	1	0
Albania	-0.053	1	0
Algeria	0.193	1	1
Angola	0.114	1	1
Antigua	-0.025	0	0
Argentina	0.018	1	0
Armenia	-0.015	0	1
Australia	0.017	0	1
Austria	-0.013	0	0
Azerbaijan	-0.067	1	1
Bahamas	0.000	0	0
Bahrain	0.031	1	1
Bangladesh	-0.039	1	0
Barbados	-0.012	0	0
Belarus	-0.016	1	1
Belgium	0.001	0	1
Belize	-0.020	0	0
Benin	-0.051	0	0
Bhutan	-0.093	1	0
Bolivia	0.051	1	1
Bosnia and Herzegovina	0.040	1	0
Botswana	0.133	0	1
Brazil	0.025	0	0
Brunei	-0.110	0	1
Bulgaria	0.040	0	1
Burkina Faso	-0.046	1	0
Burundi	-0.118	1	0
Cambodia	-0.022	1	0
Cameroon	0.061	1	1
Canada	0.009	0	1
Cape Verde	-0.039	0	0
Chad	-0.010	1	0
Chile	0.113	0	1
China	-0.013	1	0
Colombia	-0.006	1	1
Congo, Dem. Rep	-0.163	1	0
Congo, Rep	0.312	1	1
Costa Rica	-0.007	0	0
Cote d'Ivoire	-0.029	1	1
Croatia	-0.035	0	0
Cuba	-0.047	1	0
Czechoslovakia	-0.053	0	0
Denmark	0.045	0	0
Djibouti	-0.067	1	0
Dominica	-0.038	0	0
Dominican Republic	-0.022	0	0
Ecuador	0.041	1	1
Egypt, Arab Rep.	-0.099	1	0
El Salvador	-0.008	0	0
Equatorial Guinea	0.266	1	1
Eritrea	-0.153	1	0
Estonia	0.045	0	1
Ethiopia	-0.044	1	0
Fiji	-0.004	0	0
Finland	0.039	0	0
France	-0.027	0	0
Gabon	0.127	1	1
Gambia, The	-0.055	1	0
Georgia	-0.033	1	1
Germany	-0.0[illegible]7	0	0
Ghana	-0.085	0	1
Greece	-0.034	0	0
Grenada	-0.036	0	0
Guatemala	-0.017	1	0
Guinea	-0.066	1	1
Guyana	-0.128	0	1
Haiti	-0.012	1	0
Honduras	-0.014	0	0
Hong Kong	0.016	0	0
Hungary	-0.030	0	0
Iceland	0.063	0	1
India	-0.039	0	0
Indonesia	-0.012	1	1
Iran	0.089	1	1
Iraq	0.147	1	1
Ireland	0.03077	0	0
Israel	-0.00884	0	0
Italy	-0.0465	0	0
Jamaica	-0.06046	0	0
Japan	-0.02191	0	0
Jordan	-0.06204	1	1
Kazakhstan	0.01194	1	1
Kenya	-0.0255	1	0
Kiribati	-0.05484	0	0
Korea, Rep.	0.00423	0	0
Kuwait	0.40135	1	1
Kyrgyz Republic	-0.00244	1	1
Lao PDR	-0.053	1	0
Latvia	-0.003	0	0
Lebanon	-0.116	0	0
Lesotho	0.157	0	0
Liberia	-0.006	1	0
Libya	0.574	1	1
Lithuania	-0.002	0	1
Luxembourg	0.001	0	1
Macedonia, FYR	-0.006	0	1
Madagascar	-0.053	0	0
Malawi	-0.037	1	0
Malaysia	-0.039	0	1
Maldives	-0.180	0	0
Mali	-0.011	0	0
Malta	-0.027	0	0
Mauritania	0.027	1	0
Mauritius	-0.045	0	0
Mexico	0.001	0	0
Moldova	-0.003	1	0
Mongolia	0.039	0	1
Morocco	-0.044	1	0
Mozambique	-0.023	1	1
Myanmar	-0.019	1	0
Namibia	0.026	0	1
Nepal	-0.111	1	0
Netherlands	0.007	0	0
New Zealand	0.041	0	0
Nicaragua	-0.044	0	0
Niger	0.000	1	1
Nigeria	-0.014	1	1
Norway	0.244	0	1
Oman	0.053	1	1
Pakistan	-0.075	1	0
Panama	0.005	0	0
Papua New Guinea	0.034	1	1
Paraguay	0.006	1	0
Peru	0.025	0	1
Philippines	-0.010	0	0
Poland	-0.024	0	0
Portugal	-0.043	0	0
Qatar	0.126	1	1
Romania	-0.025	0	0
Russia	0.100	1	1
Rwanda	-0.016	1	0
Sao Tome and Principe	-0.233	0	0
Saudi Arabia	0.251	1	1
Serbia and Montenegro	0.017	1	1
Senegal	-0.061	0	0
Seychelles	0.044	0	1
Sierra Leone	-0.006	1	0
Singapore	0.006	1	1
Slovakia	-0.029	0	1
Slovenia	-0.006	0	1
Solomon Islands	-0.089	1	0
South Africa	0.007	0	1
Spain	0.020	0	0
Sri Lanka	-0.071	0	0
Sudan	-0.064	1	1
Suriname	-0.024	0	0
Swaziland	-0.026	1	0
Sweden	0.022	0	0
Switzerland	0.002	0	0
Syrian Arab Republic	-0.073	1	1
Taiwan	0.002	0	0
Tajikistan	-0.045	1	1
Tanzania	-0.046	1	0
Thailand	0.011	0	0
Togo	-0.029	1	1
Tonga	-0.110	0	0
Trinidad and Tobago	0.079	0	1
Tunisia	-0.028	1	0
Turkey	-0.008	0	0
Turkmenistan	0.003	1	1
Uganda	-2.65E-02	1	0
Ukraine	-0.00839	1	1
United Arab Emirates	0.180512	1	1
United Kingdom	-0.02984	0	0
United States	-0.01865	0	0
Uruguay	-0.00759	0	0
Uzbekistan	0.007572	1	0
Vanuatu	0.019974	0	0
Venezuela, RB	0.000267	1	1
Vietnam	-0.01549	1	1
Yemen	0.010883	1	1
Zambia	-0.03054	1	1
Zimbabwe	-0.20057	1	1

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